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The Meat-Type Hog

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Agricultural Research Service
UNITED STATES DEPARTMENT OF AGRICULTURE

Research over the past 20 years, aimed at discovering, developing, and improving methods by which hog raisers can produce more efficiently the kind of pork products that most consumers prefer, lends emphasis to the production of meat-type hogs.

Research has contributed to the development of methods of breeding, feeding, management, disease control, grading, and marketing that can be applied by hog growers, marketing representatives, packers, and retailers.

Information in this report was provided by the Animal and Poultry Husbandry Research Branch, Agricultural Research Service; the Market Organization and Costs Branch and the Standardization Branch, Agricultural Marketing Service

THE MEAT-TYPE HOG

THE MEAT-TYPE HOG, in simple terms, is a hog that runs more to lean than to fat. It is a "select" hog.

Research on production traits and carcass desirability indicate that the dimensions of a meat-type hog, at market weight of 225 pounds, should be about 40 to 42 inches in length from the root of the tail to a point between the ears; 11 or 12 inches wide; and 14 or 15 inches deep back of the shoulders. Backfat thickness should not be more than 1.5 inches. The cold carcass should dress out 50 percent or more of the preferred lean cuts--hams, loins, picnic shoulders, and shoulder butts.

Meat-type hogs can be produced economically and efficiently as compared to other types of hogs. More and more breeders are producing streamlined meat-type hogs, and better animals are becoming available to farmers as seedstock. The movement toward the meat-type hog has the force of a trend. Some buyers--an increasing number--are grading the hogs they purchase. Some packers are buying animals under closer grading than heretofore. Some retailers are equating price with leanness.

BACKGROUND

HOGS grown on more than 3 million farms provide an outlet for 40 percent or more of our corn crop and produce about the same proportion of our red meat. Hogs commercially slaughtered during the 5-year period, 1949-53, averaged nearly 71 million a year, not counting more than 9 million slaughtered on farms. Gross annual farm income from hogs in the period 1947-53 averaged nearly $4 billion.

Large "lardy" hogs served our needs for the first 100 years of the Nation's existence, partly because of domestic preference, partly because of a lively export market for lard. About 1880, hog breeders and producers swung to a small-type hog, which enjoyed a vogue until soon after 1900, when it began to be replaced by a medium-sized animal. World War I caused a quick demand for lard for the manufacture of munitions; with that emphasis the pendulum swung again to heavy hogs. This trend lasted into the mid-1920's.

A number of factors influenced the next change. Machinery was replacing man labor and reducing the need for so much fat in the working man's diet. People were moving to the cities and adopting more sedentary occupations, with a resulting change in diet. Vegetable oils began a spectacular rise in public favor. Lard, for domestic use and export, began a long decline to the status of a low-priced product. The hog was soon producing a year's meat for two and a year's lard for three.

Growers and breeders, who had watched the pendulum swing in hog types, were understandably confused as to what type of hog best satisfied the market and their own interests. Following a series of tests by various State agricultural experiment stations during the 1920's, the U. S. Depart-

ment of Agriculture and some State experiment stations did research on hog types. The Department's trials extended from 1931 through 1938. The tests, on 800 small-, medium-, and large-type hogs, sought to find the advantages and disadvantages of each type in prolificacy, viability, rate of growth, economy of gain, and dressing percentage.

The results generally favored the medium-sized hog. It gained better up to around 220-230 pounds and finished out on less feed, had a higher percentage of pigs that lived past weaning, seemed to meet market demands better, and was a more economical animal for the farmer to raise than either the small or the large type.

Meanwhile, since early in the 1930's, accomplishments of the Danes with their Danish Landrace hogs became known to research men and to many hog breeders in the United States. The Danes for many years have been keeping systematic records on performance in both economy of production and carcass quality. In 1934 Denmark released 30 hogs to the U. S. Government for research purposes. Six of the imported hogs were Danish Yorkshire and 24 were Danish Landrace. These imports were crossed with domestic breeds and the Department of Agriculture investigated the results. Six inbred lines were developed at Beltsville, Md., that compare favorably with Landrace hogs in general.

At about the time of these importations, the story of hybrid corn was unfolding in the Middle West, beginning with small but well-publicized plantings in 1933. Because the laws of genetics apply to both plant and animal life, animal producers began to inquire whether similar results might be obtained in their field. But experimental trials and test practices were needed. Appropriately, the Regional Swine Breeding Laboratory was established by the U. S. Department of Agriculture in the Corn-Hog Belt, with headquarters at Ames, Iowa, in 1937. Researches on swine breeding were extended to include cooperation by the States of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, Oklahoma, South Dakota, and Wisconsin. State Agricultural Experiment Stations in Maryland, Montana, and Pennsylvania cooperated in this work with the Research Center at Beltsville, Md.

RESEARCH

BREEDING

THE PURPOSE of breeding research has been to discover, develop, test, and improve methods by which hog raisers can produce more efficiently the kind of pork products that most consumers prefer.

Without going too far into the science of genetics, which the animal breeder uses as a tool, investigations over a period of about 50 years have demonstrated these principles:

¶ Inheritance is determined by paired elements in the reproductive cells--the sperm and the egg. These paired elements, now called genes, separate when reproductive cells are formed, so that the sire and the dam each transmits to each offspring one or the other but not both of the genes for each pair. The genes are carried on chromosomes in the cells.

- ¶ Each parent therefore transmits to each offspring a sample half of its inheritance; this sampling permits parents to transmit, by chance, different samples of inheritance to each offspring.

- ¶ Variations are numerous in the particular characteristics aimed for in breeding because (1) many genes (character determiners) affect a single characteristic, (2) genes differ in their ability to dominate or shape a characteristic (such as color, muscular development, prolificacy), (3) there are interactions among genes within the individual, and (4) there appear to be differences of reaction between individual animals and their environment.

- ¶ There seems to be a negative effect in the activity of some genes, so that improvement in one characteristic is associated with loss in another.

Hog breeders operate with animals that reproduce in litters rather than in single births, which complicates matters further. In addition, a number of positive performance characteristics are sought in breeding meat-type hogs, such as:

- ¶ Vigor,
- ¶ Rapid growth rate,
- ¶ Economy of gain,
- ¶ Prolificacy and mothering ability of sows, and
- ¶ Lean carcasses of high quality.

It can readily be seen that animal breeding, in the midst of all these complexities, moves quickly into the realm of mathematical probabilities. Every mating involves 40 to 60 chromosomes--carriers of the genes--and several thousand genes. The best that can be hoped for is high average results, with the average improving in the course of selection. Making use of the known tools, researchers and commercial breeders proceed largely on this basis:

Inbreeding--the mating of related animals of the same breed to stabilize variations in the characteristics of economic importance, within reasonable limits. Inbreeding was used originally to establish the breeds of hogs, over long periods of time, and it is continued in maintaining them.

Selection--choosing for further breeding the animals believed most likely to develop or continue the economically desirable characteristics being sought.

Crossing, or hybridizing--mating one breed or one line with another. Crosses of two or more lines of different breeds have resulted in hybrid offspring that significantly excelled the inbred parent stocks, and in some cases parent stocks that were not inbred. Among the advantages of hybrid vigor are increased appetite, faster growth of bone and muscle, greater number of eggs shed by sows and gilts, better survival of pigs after birth, and, apparently, better milk production by sows. Average figures on crossbreds at State agricultural experiment stations show that they raise 5 to 7 percent more pigs, grow about 6 percent faster, save 5 to 7 percent of the total feed cost, and reach market weight of 225 pounds about 2 weeks earlier than purebreds.

More than 120 different inbred lines have been tested in the course of research for meat-type hogs, more than half of which have been dropped because performance took an undesirable direction, even under selection. In one line the pigs were subject to hemophilia (uncontrolled bleeding). In others there was a tendency toward hernia. In some there were sexual malformations that prevented normal breeding. In many it was not possible to get the hoped-for combination of desired traits at acceptable levels.

A normal question, following the experience of plant breeders in going back to primitive stocks for desirable genes, is whether the so-called "razorback" hog has been used in breeding for meat types. The answer: Razorback hogs, when fed well, tend to get too fat.

Involved genetic and statistical studies have been made to determine how much of a hog's makeup depends on heredity, how much on environment. These have been valuable in assessing the chances of getting what the breeders seek. Productivity (mothering ability) of sows, including farrowing rate, survival of pigs, milk production, etc., appears to be not more than about 16 percent heritable (probably not more than 5 to 10 percent). Growth rate is 20 to 25 percent heritable. Economy of gain seems to be inherited to the extent of about 25 to 30 percent; some place it higher. Carcass desirability (conformation and desired leanness) appears to be at least 40 to 50 percent heritable. Thus it should be clear that environment (feed, management, weather, disease, etc.) may cause much of the variation in the characteristics hog men are trying to improve.

Judgment of a desirable carcass from external appearance of the live hog has been a difficult question. Carcasses can only accurately be judged by killing the hogs and examining them. A need was felt for a long time for a practical means to evaluate carcasses while the hogs are still alive--"you can't breed a carcass." A method of measuring the thickness of backfat was developed and tested in the Iowa project of the Regional Swine Breeding Research Laboratory. A slit is made in the animal's skin and a small thin metal ruler is pressed through the fat on the back at about three locations. A "lean meter" was invented by workers at the Indiana station, which uses a needle to penetrate the fat and electric conductivity to signal fat depth when the needle reaches muscle tissue. Backfat can now be measured by either of these methods (the "lean meter" is manufactured and can be bought) and hogs of desirable leanness can be selected more accurately than before to use for breeding purposes.

As a result of experimental studies and observations over a period of many years, the picture of a desirable meat-type hog has emerged (page 1). Gilts that are 40 to 42 inches long may also have more teats, the better to nourish larger litters. Some gilts and sows have as few as 8 teats; a few have 16 or 18. Selection of sows with 12 to 14 good teats, open and without deformity, is recommended. The lengthy meat-type animal often has more ribs and longer loins than shorter animals--hence produces more pork chops. The variation runs from 14 to 18 pairs of ribs.

Research leading to the establishment of new breeds of meat-type hogs was started in 1936. From then until 1956, seven new breeds were registered by the Inbred Livestock Registry Association (table 1).

TABLE 1.--New breeds of meat-type hogs developed by research

Breed	Color	Year registered[1]	Cross
			Percent of blood[2]
Minnesota No. 1.....	Red	1946	Danish Landrace 48 Tamworth 52
Minnesota No. 2.....	Black and white	1948	Canadian Yorkshire 40 Poland China 60
Montana No. 1.....	Black	1948	Hampshire 45 Danish Landrace 55
Beltsville No. 1.....	Black, white spots	1951	Poland China 25 Danish Landrace 75
Maryland No. 1.....	Black, white spots	1951	Berkshire 38 Danish Landrace 62
Beltsville No. 2.....	Red	1952	Danish Landrace 5 Hampshire 5 Duroc 32 Danish Yorkshire 58
Palouse[3]	White	1956	Chester White 35 Danish Landrace 65

[1] Registered by the Inbred Livestock Registry Association, University Farm, St. Paul 1, Minn.
[2] Approximate.
[3] Developed in Washington and named for a well-known region in the State.

FEEDING

Much basic research has been done on the proper feed for hogs.

The relationship of feed intake to the weight of hogs demonstrates why 225 pounds or less is the best weight at which to market meat-type hogs. Even hogs bred for meat-type production accumulate excess fat with feeding beyond about 225 pounds. Records on animals fed from a beginning weight of 75 pounds to 374 pounds have demonstrated that daily gain began to drop off after 175 pounds and declined more steeply after 225. More feed was required for each succeeding unit of gain, which after reaching the optimum of about 225 pounds tended to accumulate as uneconomic fat. The following figures are an example from an experimental study:

Weight of hog	Daily gain	Feed required per 50 lbs. liveweight gain
Pounds	Pounds	Pounds
75-124	1.62	167
125-174	1.75	190
175-224	1.71	206
225-274	1.65	223
275-324	1.46	252
325-374	1.31	276

Experiments have been run to find out whether limiting the feed would have a desirable effect on meat-type carcasses. Feed was limited in one test to 75 percent of normal, to 87 percent in another, and in a third it was limited only during the period of final fattening. Except among the fatter-type pigs, the rate of gain was appreciably reduced, feed requirements and the amount of fat were appreciably lowered, and the carcasses graded a little higher. A little more time and labor were required to bring the hogs to market weight.

These results emphasize the part played by heredity in determining the characteristics of carcasses. Generally speaking, carcasses of the desired characteristics can be obtained by mating animals selected for meat development and they can be full-fed without sacrificing growth rate, economy of gain, or dressing percentage.

Other research has been done on the proper feeds for market and breeding hogs, with variations to cover different ages and dry-lot and pasture conditions. Rations used at the Agricultural Research Center, Beltsville, Md., as a result of this research are given on pages 9 and 10.

MARKETING

Marketing studies covering the past 50 years have established these salient points:

- ¶ Lard production in the United States has increased; lard consumption and exports have decreased. Result: an abundance of lard, lard priced well below the liveweight price of hogs.
- ¶ Lean cuts have increased in value as a percentage of wholesale carcass value from 49 percent in 1905 to 64 percent in 1955. Lard and fat cuts, including bacon, have decreased in value from 48 percent in 1905 to 32 percent in 1955.
- ¶ Lean cuts have increased in wholesale value from 131 percent of live-hog value in 1908 to 184 percent in 1955. Fat for lard has decreased in the same period from 137 to 63 percent of live-hog value.
- ¶ Retail prices of pork have declined from 109 percent of those for beef in 1919 to 73 percent of those for beef in 1955 (after reaching an all-time low of 60 percent in 1952).
- ¶ Consumer expenditures for pork have declined from a high of 115 percent of those for beef and veal in 1927 (and another peak of 123 percent in 1943) to 61 percent of those for beef and veal in 1955.
- ¶ About 2.75 cents of the consumer's dollar was spent for beef in 1955, only 2 cents for pork.

GRADING

A system of grading hog carcasses has been long evolving. The first such system of grading market hogs was formulated by the U. S. Department of Agriculture in 1918 for use in the livestock market reporting service. After meetings with producers, animal husbandmen, market representatives, and slaughterers, revisions were made in the tentative standards in 1930 and in 1940. Official standards were adopted in 1952 and revised in 1955.

These grades have been approved with the help of farmers, market representatives, packers, and retailers:

U. S. No. 1.--Near minimum finish required to produce high quality pork cuts. Yield more than 50 percent of carcass weight in major lean cuts of hams, loins, picnics, and shoulder butts. At the popular market weight of 200-225 pounds and carcass length of 27 to 30 inches, backfat thickness ranges from 1.3 to 1.6 inches.

U. S. No. 2.--Slightly fatter than necessary to produce high quality pork, cuts require considerable trimming. Yield 47 to 50 percent in the four trimmed lean cuts. At the same weights and lengths, backfat thickness ranges from 1.6 to 1.9 inches.

U. S. No. 3.--Decidedly overfat, with large amounts of internal fat remaining even after heavy trimming. Yield of lean cuts usually less than 47 percent. Backfat thickness of 1.9 inches or more, at the same weights and lengths.

Medium.--Slightly underfinished, produces soft cuts with little or no marbling. Yields of lean cuts relatively high but ratio of total lean and fat to bone is slightly low. Backfat thickness ranges from 1.0 to 1.3 inches at the same weights and lengths.

Cull.--Decidedly underfinished, very inferior cuts. Backfat thickness ranges from 0.9 to 1.2 inches or less for prescribed lengths and weights.

In each grade, lighter or shorter carcasses are required to have less backfat, whereas heavier or longer carcasses are permitted to have more.

These grades, designed to indicate leanness, fatness, and quality, are being used by the Department of Agriculture in its market reporting service. They are available to the trade but are not yet as widely used as Federal grades for other livestock.

At present there is little or no grading of individual pork cuts. In pork quality evaluation studies made by the Agricultural Research Service, it has been found that there is a wide variation in fatness and leanness. In tests carried out by taste panels less difference was found in texture (fine- or coarse-grained meat fibers), tenderness-toughness, and dryness-juiciness--the characteristics that tend toward palatability. This was the case with meat from animals fed a normally good diet. No essential difference has been found in the quality of pork from hybrid hogs and that from the purebreds or crosses if all are fed a diversified well-balanced diet that fulfills their nutritive needs.

A need exists in the retailing of pork, especially in prepackaged materials, to provide graded products that reflect muscular development and other desirable quality characteristics.

PUTTING THE RESEARCH TO WORK

ONLY 15 to 17 percent of the 70 to 80 million hogs going to market are meat-type hogs.

Every breed has its leaner types as well as those that run to fat. A farmer with good foundation stock can start with what he has and work

toward the production of meat-type hogs by selecting his sows for meat-type and by using the best meat-type boars obtainable. Good feeding and good management are also essential. Research has shown that no breed of hogs has a monoply on meat-type animals. It should be possible to improve each of the breeds for leaner carcasses.

Research has shown that any permanent improvement in animals must be made by breeding, but environment more than heredity causes the variations observed in characteristics among which improvement is desired. Therefore, it is important to keep animals under the same feeding and management practices until selection can be made.

BREEDING

The most economical way for a farmer to start into meat-type hog production is to begin with sows and gilts already on the farm, choosing them as far as he can for meat-type characteristics. He would then only need a new boar. When possible the boar should be purchased from a breeder who is selecting for meat-type animals. This of course does not preclude the purchase of meat-type female animals and using a meat-type boar already on hand, but this course is more expensive. To obtain the advantages produced by hybrid vigor, the boar should be of a different breed than the sows. If a hybrid boar is chosen, he should be from lines known to combine well with the breeding of the sows on which he is to be used. Most producers of hybrid boars guarantee the breeding ability of their males.

If the grower has records on his sows and gilts--and records are a necessity as this line of work is pursued--they should be chosen on the basis of prolificacy and the production of pigs with a high growth rate and a low thickness of backfat. The buyer of a boar should satisfy himself that records on the animal he selects assure him, in so far as possible, that the animal he is getting is from meat-type parents. If sows and gilts kept for breeding have a low number of teats, the boar should be chosen in part for a high number--12 or 14.

Research studies have focused emphasis upon the need to identify genetically superior animals with respect to all the important characteristics. Three tools are most important: (1) Records on production, (2) scales, and (3) backfat measurements.

Records are necessary to the continuing process of selection. Minimum records should include the number of pigs per litter, number raised, rate of gain, economy of gain, and backfat thickness.

Scales are necessary to obtain records of weight gain and economy of gain.

Backfat measurements can be made by any farmer, easily and quickly, once practice has perfected the technique. Three slits a quarter of an inch long are made in the skin, each about 2 or 3 inches off the center line of the hog's back, one just behind the shoulder, one at the middle of the back, and one over the loin or fore part of the ham. A slender metal ruler one-fourth inch wide (available from some breed associations) is pressed through the fat to muscle tissue and the measure taken. Or a "lean meter" (page 4) may be used. The three figures are averaged for a single backfat measurement. If the keen-edged instrument for making the incisions and

the ruler are sterilized after each use there is very little likelihood of infection, and the process seems to cause no serious discomfort to the hog. Separate records are needed of boar, gilt, and barrow measurements because measurements of boars, barrows, and gilts are not comparable. Hogs should be weighed at the time of measurement so weight and backfat thickness can be adjusted to a standard weight.

Selecting the leanest hogs for breeding can change the quality of hogs being produced, for fatness is one of the most highly heritable characteristics. Records indicate which sows should be chosen for further breeding, because of their prolificacy (mothering ability), growth rate, and backfat thickness. If some improvement in carcasses has not resulted from the boar used, another should be sought.

Purebred breeders and owners of commercial herds should follow the same general procedure, always selecting the best boars and gilts for further breeding.

Although the keeping of records and using them in selection brings in a new set of chores, records improve the chances of success.

FEEDING

The rations for hogs used in breeding and other experiments at the Agricultural Research Center have been worked out over a period of years.

Pigs are weaned at 8 weeks. The growing ration for weaned pigs until they weigh about 90 pounds consists of 70 percent corn (barley, wheat, oats, or other available farm grain) and 30 percent protein-mineral mixture. From 90 to 160 pounds weight the proportions are 75 percent grain and 25 percent protein-mineral mixture. The fattening ration from 160 pounds to the market weight of 225 pounds is 83 percent grain and 17 percent protein-mineral mixture.

The composition of the protein-mineral mixture and that of the mineral fraction, which is mixed with it, is as follows:

Protein-mineral mixture

	Pct.
Soybean meal	35
Alfalfa meal	20
Linseed meal	20
Fishmeal	10
Tankage	10
Mineral mixture	5
	100

Mineral mixture

	Pct.
Pulverized limestone	31.3
Iodized salt	33.0
Steamed bonemeal	33.0
Ferrous (iron) sulphate	2.0
Zinc oxide	.4
Manganese sulphate	.2
Copper sulphate	.1
	100.0

Special rations have been worked out for sows during the gestation and suckling periods. Sows are hand-fed during gestation to keep them from getting too fat, the ration is gradually increased after farrowing, and in a week or 10 days thereafter the sow is self-fed a full ration on pasture:

Gestation period (Hand-fed) Pounds	Ingredients	Suckling period (Self-fed) Pounds
55.00	Ground yellow corn	45.00
--	Standard middlings	17.50
15.00	Alfalfa meal	5.00
15.00	Coarsely ground or rolled oats	15.00
3.75	Soybean meal	7.50
3.75	High-grade fishmeal	3.75
3.75	60-percent tankage or high-grade meat scraps	3.75
2.50	Linseed meal	--
1.25	Mineral mixture	2.50
100.00		100.00

Pounds	Mineral mixture	Pounds
34.6	Ground limestone	34.6
35.0	Steamed bonemeal	35.0
30.0	Iodized salt	30.0
23.0	Glauber's salt	--
2.0	Ferrous sulphate	2.0
.4	Zinc oxide	.4
125.0		102.0

In addition to each of the rations given above, to each pound of diet there is added 5 or 6 milligrams of antibiotics and 5 or 6 micrograms of vitamin B_{12}.

MANAGEMENT

The grower of meat-type hogs can always follow to advantage these approved principles of management:

- Clean farrowing pens thoroughly, before birth of the litter, to prevent the inroads of diseases and parasites.
- Use heat lamps in a corner of the creep for new-born pigs when the weather is cold.
- Haul sow and pigs to clean ground when pigs are 10 to 14 days old.
- Castrate male pigs intended for the market when they are 2 weeks old.
- Start creep feeding at 2 to 3 weeks.
- Vaccinate for hog cholera when pigs are 6 to 8 weeks old.
- Provide an adequate ration for self-fed weanlings.

¶ Separate breeding stock from market pigs at 20 weeks.

¶ Take all possible precautions against disease--meat-type hogs are chosen for conformation and performance but they are as susceptible to diseases as other hog stock.

MARKETING

The farmer starting to grow meat-type hogs is entering a business that produces more actual value:

¶ The yield of lean cuts runs from 44 percent in fat hogs to better than 50 percent in meat-type hogs--13 or 14 pounds of the more desirable cuts, with a corresponding decrease in the amount of fat.

¶ Lard was worth about 10 cents a pound to the farmer in 1955 and the preferred cuts were worth about 45 cents a pound.

¶ Thus, the worth of each animal may be enhanced by as much as $5 per head.

Packers and retailers would prefer to have about 50 percent of meat-type hogs flowing into the market, rather than the present 17 percent, before they begin to purchase by grade and pay an incentive price for leaner animals. Nevertheless an increasing number of buyers are willing to buy by grade and more packers than before are paying more for lean meat than for money-losing lard. Farmers and those interested in meat-type hogs may have to do some searching for the more promising outlets.

Department of Agriculture personnel working with this program are convinced that the farmer who has meat-type hogs to sell will be in a more favorable position when he looks for a market than the farmer with only fat-type hogs to sell. That is to say, the more meat-type hogs there are looking for a market, the more likely they are to find it.

The most common practice at present is to sell hogs on a lot basis. Any recognition of the leanness of the hogs is reached through agreement between the farmer or other seller and the buyer as to the grades included in the lot.

Individual grading of live hogs--which is practiced in some places--would permit more accurate pricing, come nearer to paying the farmer for quality produced, and have educational benefits for both buyer and seller. However, many problems stand in the way of widespread adoption of individual live grading, in the light of present facilities and practices in most markets of the United States.

A farmer would profit still more from meat-type animals if they were "rail-graded" as carcasses, as has been done in some countries for many years. Carcass grading is more accurate than live grading--anyone can tell more about the amount and quality of retail cuts by inspecting the carcass than by appraising the live animal. Shrink and fill do not count in carcass grading, and the farmer is paid for the kind and amount of meat produced. But, this method would involve intricate problems of identification, bookkeeping, and delayed payment for which none of the interested parties are yet prepared.

THE OUTLOOK

MANY INDICATORS point to a gradually increasing acceptance of the meat-type hog. The trend has been 50 years in the making. There is increasing approval of the lean-type animal by producers, processors, and the consuming public. Some of the indicators:

Price.--Some packers have been paying a differential for leaner hogs for several years. The number is increasing. Some have quit paying a premium for lean hogs and are penalizing fat hogs.

Live-hog grading.--Buyers are being trained in some places to purchase hogs by individual grading. At the urging of various colleges, marketing agencies, and swine associations this method is becoming more common, guided by the U. S. grades established for carcasses.

Grading pork cuts.--The lean meat in bacon ranges from 12 to 40 percent. Best bacon is 25 to 30 percent lean. Retailers here and there are recognizing the different quality of various cuts and are selling graded meats at differential prices. No grades have been worked out for pork cuts, but prepackaging and other considerations may soon cause a voluntary system of grading to develop within the industry. The packing industry has started a program of trimming more fat from retail cuts; this has its appeal to consumers, but does not reduce internal fat, nor does it reduce the oversupply of lard.

Breeding stock.--Several breed associations have initiated programs for certifying litters on a basis of performance and carcass quality. This should aid in the search for meat-type boars. The Regional Swine Breeding Research Laboratory at Ames is testing methods of selection and plans of breeding for further improvement of hogs. Extension Services in various States are helping to set up testing stations to measure the rate of gain and utilization of feed, to assist hog breeders in finding superior stock. At the same time, buyers and others are being taught how to grade live hogs by measuring backfat and other methods.

Artificial breeding is not practical with hogs at present. It may become practical and be generally used in the future. There are difficulties. Keeping quality of the semen is one of the great problems. Research is being done on this and other problems of artificial breeding of hogs.

"Pig hatcheries."--The idea of raising pigs in central "hatcheries" has not become a stable business. One of the main problems has been disease, which can spread rapidly through a large central establishment. Some operators have met the problem by decentralizing their operations to a number of farms. But it is difficult to have stock of the right size and age on hand when ordered.

Trend among breeds.--Examination of breed association journals over the past 20 years shows that hogs of all breeds have been slimmed and streamlined gradually away from the full-fashioned animals of a score of years ago. Farm journals, which carry advertising of various breeds of hogs, have within recent years started to carry headings to advertise meat-type hogs of various breeds.

Winners at fairs.--The meat-type hog has won recognition in the judging ring at many larger shows. In Iowa in 1955, for instance, the grand champion hog was characterized as "a good meat type," and the trend is noticeable in other fairs.

Research.--The Agricultural Research Service has begun a new project to study the effectiveness of selection for high and low degrees of fatness in swine. This project is developing, within each of a fat- and lean-type breed, a line high in thickness of backfat and a line low in backfat thickness. The twofold purpose is to determine the effectiveness of selection in changing carcass composition and to measure the hereditary and environmental factors in backfat thickness and related carcass characteristics. This project will probably take about 5 years to complete.

Another project, of "reciprocal recurrent selection" for superior performance in swine, is expected to run 10 to 15 years. Foundation stock will be chosen from meat-type animals representing three pure breeds and three hybrid lines. Two strains of hogs will be developed, representing diverse sources of germ plasm. One strain will be derived from the pure breeds and one from the three hybrid lines. Selection within each strain will be based primarily on the performance of crosses between the two strains. Performance to be measured will include litter size at birth and at weaning, litter weight at weaning, and rate of growth to 140 days.

Ten State agricultural experiment stations are cooperating in the Regional Swine Breeding Laboratory to investigate the application of genetic methods in hog-breeding. Emphasis is being placed on characteristics of economic importance, both from the standpoint of production and that of carcass evaluation, as related to the development of meat-type hogs. Breed associations and private breeders are becoming increasingly alert to these basic problems.